Size Estimates of Extinct Eocene Aquatic Snakes from Central Georgia

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Introduction

Fossil deposits of the Eocene occur in the Barnwell Group sediments that stretch across central Georgia just south of the modern fall line (fig 1 & 2). Kaolin mining in central Georgia reveals these Eocene fossil bearing sediments (fig 6). Here we describe Eocene ancient sea snake fossil vertebrae and use the vertebrae to estimate the body length of those ancient sea snakes. The vertebrae were recovered by surface collection of sediments exposed by mining. Similar sediments in nearby kaolin mines have been dated to the Late Eocene, 34.5-35.5 ma (Parmley and Cicimurri 2003). The two sea snake species from the Eocene are *Palaeophis* and *Pterosphenus*.

Materials and Methods

To estimate the body length of the sea snakes, a regression was created for modern day boid snakes of know body length, comparing centrum length and total body length. An average centrum length of nine modern day boids was used (fig 9). Forty vertebrae from each modern day snake was used to create regression (Fig 7 & 8). The equation created by the regression was used to estimate the total body length of the ancient sea snakes.

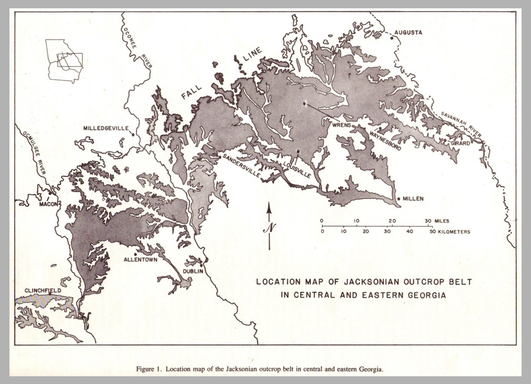

Figure 1. Map displaying presence of Eocene sediments across middle Georgia (Huddleston and Hetrick 1985).

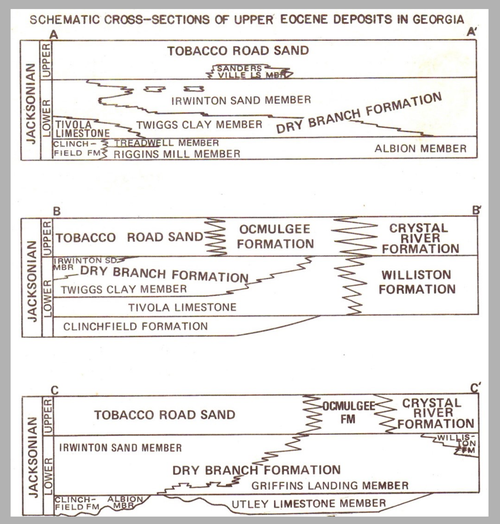

Figure 2. Cross section of middle Georgia geology provided by Huddleston and Hetrick (1985).

Figure 3. Displays all of the ancient sea snake vertebrae recovered from a kaolin mine.

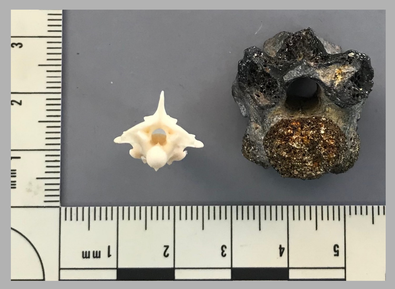

Figure 4. Comparison of an extant rat snake and an extinct sea snake vertebra.

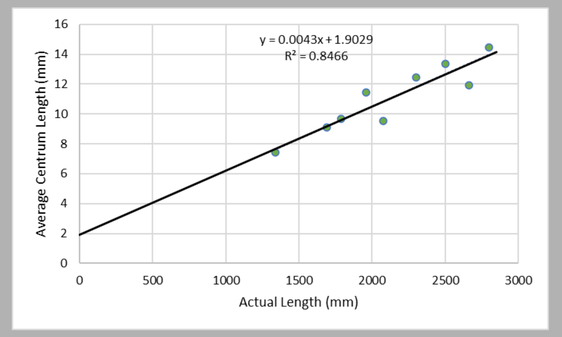

Figure 5. A graph showing the results of the modern day boids centrum length regression. The line of best fits gives an r-squared value of 0.8466.

Figure 6. A women recovering fossils in an open pit kaolin mine in central Georgia.

Figure7. Lateral view of a modern day boa constrictor. Black line is 2 mm.

Total body length is 2.8 meters.

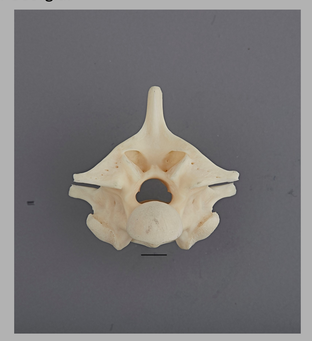

Figure 8. Posterior view of modern day boa constrictor. Black line is 2mm.

Figure 9. Lateral view of ancient sea snake. Arrows represent centrum length measurement. Total body length estimated at 5.3 meters.

Figure 10. Posterior view of ancient sea snake. Black line is 2mm.

Results

The results of the regression analysis produced a r-squared value of 0.8466. The line of best fit that was created for the regression produced an linear equation of 0.0043x + 1.9029=y (fig. 5). That equation could then be used to estimate the total body lengths of the ancient sea snakes. This estimation is done by using the centrum length of the ancient sea snake vertebra in the equation to calculate an estimate of total body length. The estimates ranged from 1.6 to 5.3 meters (5.3 to 17.4 feet). Fig 4 can be used to reference size difference in ancient and modern snakes.

Discussion

The r-squared value being 0.8466 is significant because it shows further evidence for earlier research that there is a relationship between total body length and vertebra centrum length for these ancient sea snakes and modern day boids (Parmley and Reed 2003). The largest of these ancient sea snakes are estimated to be 5.3 meters (17.4 feet) long which is a massive snake (fig 9 & 10) . The largest modern day snake measured was only 2.8 meters long (9.2 feet) (fig 7 & 8). However, this estimation only works to find total body length. This leads to the question of how girthy or thick were these ancient sea snakes. This could be explored in future research.

Literature Cited

Parmley, D., and D.J. Cicimurri. 2003. Late Eocene Sharks of the Hardie Mine Local Fauna of Wilkinson County, Georgia. Georgia Journal of Science 61, 153-179.

Parmley, D. and H.W. Reed. 2003. Size and age class estimates of North American Eocene Palaeopheid snakes. Georgia Journal of Science 61:220-232.

Acknowledgments

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